X-Ray Diffraction and Fluorescence Instrument for Mineralogical Analysis at the Lunar Surface, Phase I

Completed Technology Project (2009 - 2009)

Project Introduction

We propose to develop a compact and lightweight X-Ray Diffraction (XRD) / X-Ray Fluorescence (XRF) instrument for analysis of mineralogical composition of regolith, rock samples and dust, in lunar surface exploration. The instrument inherits from the general concept of CheMin, the XRD/XRF instrument of MSL, but is entirely redesigned to provide a more compact and lightweight unit, and reduced costs. Many implementation details of the proposed instrument will inherit from the design of a small portable XRD/XRF instruments developed and marketed by inXitu, Inc. and a robotic instrument derived from this design. The objective of this proposal is to bring this development to a high TRL of 6 to 7, to enable fast and cost effective development of subsequent flight systems. A high TRL target is possible within the scope of an SBIR Phase I + II because several key technological developments required for this objective have been or are being- addressed by the company through separate sources of funding. Furthermore, the proposed work leverages the extensive experience of the PI and the company with this type of instrumentation, in both terrestrial and planetary applications.

Anticipated Benefits

This development will enable next generation portable field XRD/XRF instruments for geological analysis in the field, mining, oil, forensic, art, and also dedicated applications such as in-vacuum process monitoring tools for thin film deposition, robotic systems for quality control, or low cost benchtop instrument for routine analysis in the laboratory or education. The proposed instrument would be fitted to a landed platform, rover or lander, to perform mineralogical analysis of the regolith, rocks, ices, and dust at the lunar surface. The flight instrument will weight about half that of the MSL CheMin instrument and require about ten times less energy to perform an analysis at identical or improved XRD performance. These improvements will enable small missions with limited payload to be fitted with XRD/XRF capabilities. Although this development is focused on lunar applications, the technology would equally benefit landed planetary missions requiring definitive mineralogy capabilities.

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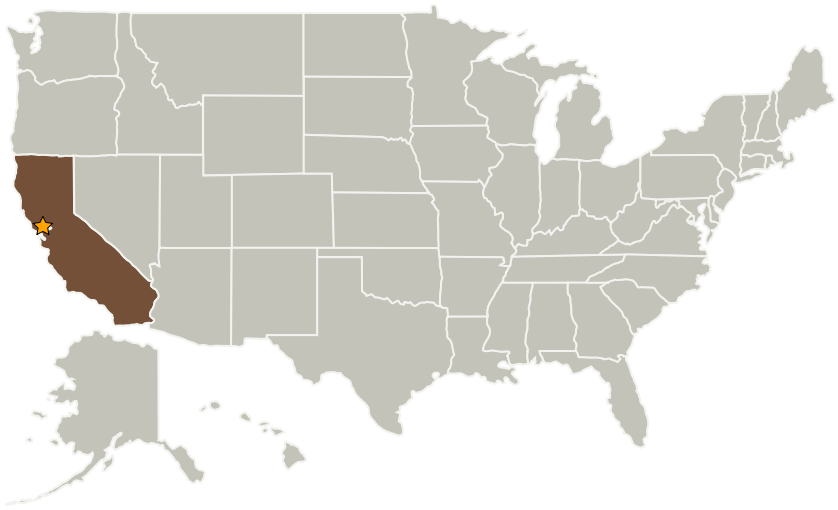
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
inXitu, Inc.	Supporting Organization	Industry	Mountain View, California

Primary U.S. Work Locations
California

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

David F Blake

Principal Investigator:

Philippe Sarrazin

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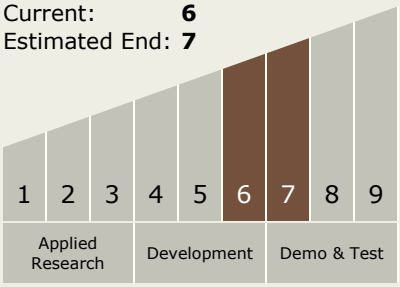
Technology Maturity (TRL)

Start: **6**
Current: **6**
Estimated End: **7**



Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.3 Manipulation
    - TX04.3.4 Sample Acquisition and Handling